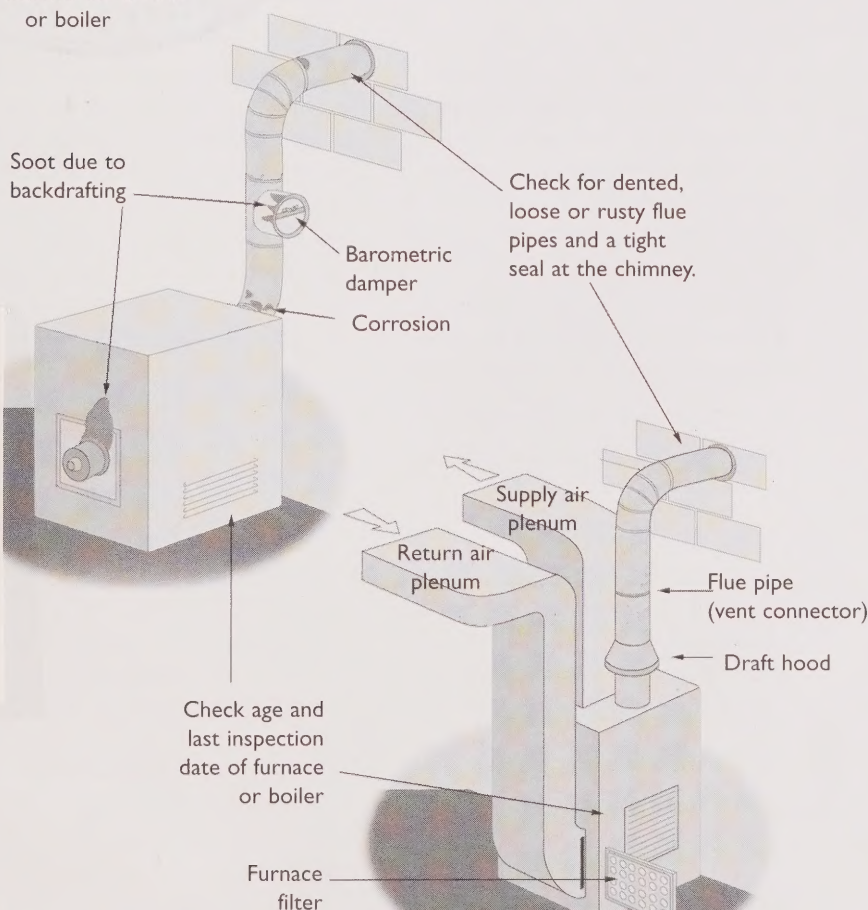


A

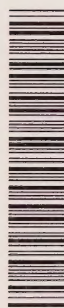
CAI  
MH4  
- 2000  
C28KGovernment  
Publications

## ABOUT YOUR HOUSE

CE 28k

BEFORE YOU START  
ASSESSING THE COMFORT AND  
SAFETY OF YOUR HOME'S  
MECHANICAL SYSTEMSConventional oil furnace  
or boiler

The heating, ventilating and air conditioning (HVAC) systems are a vital part of every home. These mechanical systems help control the indoor conditions you need for comfort, health and safety. How these mechanical systems interact with other appliances is critical in keeping your home's indoor environment healthy and safe.

Conventional natural gas or  
propane forced air furnaceHOME TO CANADIANS  
Canada  
3 1761 11637419 0



## Common Situations

Many homeowners are happy with their present location. When extra space is needed, an addition is often a more desirable alternative than moving to a different house. The size and scope of additions vary widely. A simple project may involve a larger entry area or adding a small bay onto a kitchen or living room, while larger additions can substantially increase the size of your home.

As you plan your addition, here are some important things to consider:

- **Size and design**—Before deciding on a new addition, evaluate whether rearranging the existing space might give you the changes you want. It is important to determine what size the addition needs to be and how it will integrate with the rest of the house. Homeowners often underestimate how much space that items like stairways require. The addition will be more appealing if the style complements the design and architectural details of your house and neighbourhood.
- **Fixtures**—Since the addition is essentially new construction, new fixtures may be required.
- **Structural problems**—The addition will often involve structural changes to the existing house, which may involve foundation considerations, roof details or the construction of openings in the existing building. As part of the work, any problems found in the existing building and foundation will have to be repaired.
- **Moisture**—The cause of any moisture problems in the existing house will need to be diagnosed and remedied as part of the renovation work. Existing problems can affect new areas of the building.

## Healthy Housing™

Renovating is an ideal time to make your house healthier for you, the community and the environment. When designing an addition to your home, be sure to consider:

- **Occupant health**—moisture control strategies, low emission materials and products, ventilation for improved indoor air quality.
- **Energy efficiency**—effective air and moisture barriers and insulation, energy efficient mechanical systems, lighting, fixtures and appliances.
- **Resource efficiency**—water conserving appliances and fixtures.
- **Environmental responsibility**—durable materials that will last longer and minimize future waste in landfill sites, recycling fixtures to reduce construction waste.
- **Affordability**—energy and water efficient fixtures to reduce ongoing operating costs, durable products to reduce future repair and replacement expenses.

## House as a System

A house is much more than just four walls and a roof—it's an interactive system made up of many components including the basic structure, heating, ventilating and air conditioning (HVAC) equipment, the external environment and the occupants. Each component influences the performance of the entire system. A renovation provides an opportunity to improve how your house performs.

An addition gives you the chance to use up-to-date, energy efficient

construction practices. These projects often require changes to HVAC equipment that can improve moisture management and air quality in the house. Some equipment such as a large volume exhaust fan can cause combustion heating appliances to backdraft. Structural changes may give you a chance to improve airtightness and insulation, resulting in increased occupant comfort and house durability.

- **Plumbing and electrical**—the increased plumbing and electrical needs may exceed your existing services, requiring significant upgrades. Remember to run cables for telephone and computer connections, cable TV and security or home entertainment systems.
- **Heating and ventilation**—Existing heating and ventilation systems may not have adequate capacity to handle the increased demand.
- **Finishes**—always pick finishes that match or complement existing finishes and are durable enough to take the wear and tear of daily use.
- **Zoning and regulations**—new work will have to comply with provincial building codes as well as local bylaws and zoning requirements.





# Avoid Surprises

Once you start work on an addition, changes become costly or difficult and can lead to delays in the completion of the project. Thorough planning at the beginning will help

you to develop a realistic understanding of the work to be done and the costs involved. Here are some of the likely situations that people encounter. However, it's

always wise to consider hiring a qualified professional such as an engineer, architect or professional renovator to assess the structural issues.

## Ask yourself...

## Consider your options...

## ...and if you don't

### Size and design

- |  |  |   |
|--|--|---|
| <ul style="list-style-type: none"><li>• How will the addition meet the needs of everyone in the household, including anyone with special needs, extended family and guests? What size will it have to be to meet current and future needs?</li><li>• How will the addition affect spaces in the existing house, especially traffic patterns, access to outdoors and natural lighting?</li><li>• What style will complement the design of the existing house? Does it fit into the neighborhood?</li><li>• Will there need to be changes in landscaping, or driveway and walkway locations?</li></ul> | <ul style="list-style-type: none"><li>• Plan thoroughly before you start so that space, traffic flow and styling meet your current and future needs.</li><li>• Consider using an architect or professional designer. They can help you work through the problem areas and create a flexible, properly sized design that meets your current and future needs and complements the style, layout and site of your house.</li><li>• Have complete scale drawings made to determine how the addition will connect to the existing house. These will be required for the building permit and will help you to visualize the project better. Furniture layouts can also be a great help in your planning.</li></ul> | <ul style="list-style-type: none"><li>• If you compromise on your needs you will have to live with the results.</li><li>• Good design and working drawings are important for maximizing the space and minimizing problems. Insufficient planning can lead to poor results and costly mistakes. If you don't solve the problems during the planning stage, it may force you into crisis problem solving as the project progresses.</li></ul> |
|--|--|---|

### Fixtures

- |  |   |   |
|--|---|---|
| <ul style="list-style-type: none"><li>• Will new fixtures and appliances be needed? What types are suitable? How much space will they use?</li><li>• How much and what type of lighting is needed?</li></ul> | <ul style="list-style-type: none"><li>• Get measurements for fixtures and appliances from suppliers.</li><li>• Familiarize yourself with available products and options.</li><li>• Use a professional designer to help plan your fixture and lighting layout.</li><li>• Choose lighting and appliances that are energy efficient.</li></ul> | <ul style="list-style-type: none"><li>• Larger than expected fixtures or appliances can lead to costly modifications or restrictions on the useable space in your new addition.</li><li>• Poor lighting will detract from the look, feel and usability of the new space.</li><li>• Inefficient appliances and light fixtures waste energy and will mean higher annual energy costs.</li></ul> |
|--|---|---|

## Ask yourself...

## Consider your options...

## ...and if you don't

### Smells

- |   |  |   |
|---|--|---|
| <ul style="list-style-type: none"><li>• Is there a wood smoke smell from the fireplace in the house? Are there combustion smells?</li></ul>   | <ul style="list-style-type: none"><li>• Investigate the source of the smells and take action to correct the problem. Regularly noticing smells from combustion gases and wood smoke from the fireplace or other combustion appliances in the house suggests that the flue is not functioning properly. It may also be the result of pressure imbalances in the house that can be solved by flue maintenance, properly balancing the heating system and adding make-up air.</li></ul> | <ul style="list-style-type: none"><li>• Combustion by-products are toxic and in the worst cases can cause death.</li></ul>  |
| <ul style="list-style-type: none"><li>• Does smoke come into the house from the chimney? Are there fuel smells in the furnace area?</li></ul> | <ul style="list-style-type: none"><li>• Get the chimney inspected and cleaned by a qualified tradesperson.</li></ul>   | <ul style="list-style-type: none"><li>• Blocked and dirty flues are a fire hazard. If flues are blocked entirely, then combustion gases will spill into the house, which can have serious health impacts and can cause death.</li></ul> |
| <ul style="list-style-type: none"><li>• Are there any fuel-burning appliances in the house? Are there any smoke or gas detectors?</li></ul>   | <ul style="list-style-type: none"><li>• Install a smoke detector and a carbon monoxide (CO) detector to alert you to any combustion gas spillage that may be occurring.</li></ul>  | <ul style="list-style-type: none"><li>• Combustion gas spillage is a major safety risk that can have serious health impacts at high concentrations. Carbon monoxide is toxic and can cause death.</li></ul>                             |

### Comfort

- |  |   |   |
|--|---|---|
| <ul style="list-style-type: none"><li>• Is there even distribution of heat throughout the house? Are there cold spots?</li></ul> | <ul style="list-style-type: none"><li>• Make sure the warm air registers (or hot water valves in a hydronic system) are open to allow heat in.</li><li>• Upgrade the insulation in cold areas. Cold spots can be caused by an improperly laid out or inadequate heating system.</li><li>• Balance the heating system and seal the ducts. This will likely be needed when major renovations are being done and if the heating ducts (or hot water pipes) are exposed.</li><li>• Consider using supplementary heaters or booster fans to provide additional heat. This could be an electric heater or electric radiant panels in the floor.</li></ul> | <ul style="list-style-type: none"><li>• Cold spots in the house, especially on outside walls and ceilings, are areas where condensation will occur. Condensation, dust and other organic material on the wall surface creates ideal conditions for mold growth that can compromise indoor air quality (IAQ) in the house.</li><li>• Improper or inadequate adjustment of the heating system can create excessive pressure imbalances in the room. This could affect the operation of combustion appliances in the house.</li><li>• Adjustments after a renovation may require changes to the finished work.</li></ul> |
|--|---|---|



## Ask yourself...

## Consider your options...

## ...and if you don't

- 
- |  |   |  |
|--|---|--|
| <ul style="list-style-type: none"><li>• Are there heating ducts or pipes that run through unheated space such as an unheated crawl space or in the attic area?</li></ul> | <ul style="list-style-type: none"><li>• Air-seal and insulate the ducts or water pipes to reduce heat loss in unheated spaces. Consider relocating the ducts.</li></ul> | <ul style="list-style-type: none"><li>• Heat will continue to be lost through uninsulated ducts or pipes. Condensation can form in the ducts, which can cause moisture problems and be a breeding ground for mold. Ducts can also carry dust, mold spores and other contaminants that can be drawn into the house.</li></ul> |
|--|---|--|
- 
- |   |  |  |
|---|--|--|
| <ul style="list-style-type: none"><li>• Are there areas of the house that always seem drafty and uncomfortable?</li></ul> | <ul style="list-style-type: none"><li>• Air-seal the house including repairing or replacing window and door weatherstripping. Areas that are constantly drafty suggest large amounts of air leakage.</li></ul> | <ul style="list-style-type: none"><li>• Outdoor air will continue to enter, carrying in pollens and dust from the outside.</li><li>• Warm air carrying moisture can escape through cracks and pores of the building causing moisture problems indoors.</li></ul> |
|---|--|--|
- 
- |   |   |   |
|---|---|---|
| <ul style="list-style-type: none"><li>• Is it difficult to maintain comfort conditions?</li></ul> | <ul style="list-style-type: none"><li>• Replace old controls. Maintaining constant temperatures requires good controls. Place thermostat in a location that is out of the sun to get an accurate reading of the average house temperature.</li><li>• Consider zoning the house, so that the sunny south side would be on its own zone, while areas in constant shade or on the north side would have their own control.</li></ul> | <ul style="list-style-type: none"><li>• Comfort conditions will be hard to maintain. Older thermostats are not as accurate as today's electronic models. Electric heaters with built-in thermostats are especially vulnerable to wide temperature swings as the heating element itself influences the thermostat.</li><li>• Improperly placed thermostats that are too close to a heating element, an outside door or in direct sunlight will not be able to provide a proper control function.</li></ul> |
|---|---|---|
-

---

**Plumbing and electrical**

---

- |   |   |  |
|---|---|--|
| <ul style="list-style-type: none"><li>• Does the existing plumbing service provide adequate water pressure and drains that flow quickly? Will the addition increase demands on the existing plumbing?</li><li>• Is the existing electrical service adequate for the increased number of outlets and circuits that will be needed?</li><li>• What are the needs for current and future telephone and computer connections, cable TV, security, home entertainment systems or smart house features?</li><li>• What plumbing and electrical code requirements apply to the new addition?</li></ul> | <ul style="list-style-type: none"><li>• Repair any plumbing leaks and upgrade the existing service as required.</li><li>• Upgrade and repair electrical service and wiring as required.</li><li>• Equip outlets near sinks with ground fault circuit interrupters to prevent danger from shock.</li><li>• Assess your current and future needs for wiring and connections. Consider upgrades that will improve the resale value by addressing trends in home offices, home entertainment and smart controls for appliances and mechanical systems.</li><li>• Consult with a professional to determine that plumbing and electrical code requirements are addressed in your plans.</li></ul> | <ul style="list-style-type: none"><li>• Inadequate or substandard plumbing will be the cause of ongoing inconvenience and may be a health hazard.</li><li>• An undersized electrical service can lead to circuit overloads that are a fire hazard.</li><li>• Wiring and controls will have to be installed later limiting the choice of location. Surface mounting of cables can detract from the finished appearance of the job.</li><li>• Not meeting codes can cause costly changes during construction and delay completion of your project.</li></ul> |
|---|---|--|

---

**Heating and ventilation**

---

- |   |  |  |
|---|--|--|
| <ul style="list-style-type: none"><li>• Does the existing heating system have the capacity to handle the increased demand of the addition?</li><li>• Does the house have a ventilation system and will it handle the increased demand of the addition?</li><li>• Is this an opportunity to install a more energy efficient heating system?</li><li>• What energy efficient practices can be used to minimize the additional heating requirements?</li><li>• What heating devices are appropriate for the new space? Will any new heating devices that use wood, oil or gas be subject to backdrafting? Will a new, large exhaust fan cause backdrafting of existing or new combustion appliances?</li></ul> | <ul style="list-style-type: none"><li>• Upgrade or replace equipment as required to ensure adequate heating, cooling and ventilation for the existing and new areas. Choose energy efficient equipment.</li><li>• Consider installing a whole house ventilation system. Choose one that includes heat recovery.</li><li>• Build a well insulated and air sealed addition to minimize heating requirements.</li><li>• Use a qualified, licensed installer for heating and ventilation work.</li><li>• Test for backdraft potential. Avoid the use of large volume exhaust fans that can pull smoke and combustion gases in through a flue. A trained technician can remedy or avoid this health and safety problem.</li></ul> | <ul style="list-style-type: none"><li>• An undersized or poorly installed heating system will make the addition difficult to heat in cold and windy weather conditions.</li><li>• Improper ventilation can lead to poor indoor air quality, lingering odours and excess humidity.</li><li>• Backdrafting of combustion equipment such as fuel burning fireplaces, furnaces, wood stoves and water heaters that use oil, natural gas or propane is a safety hazard and can also lead to smoke damage of your house.</li></ul> |
|---|--|--|



**Finishes**

---

- What types of finishes are needed and preferred for the new addition? How will the finishes blend with the rest of the house?
- What finishes for items such as countertops, floors and walls are durable enough for the intended use?
- What floor finishes are compatible with the floor system?
- What skills are needed to properly install these finishes?
- What finishes and materials will minimize the impact on IAQ?
- Do your research. There are many new and different products on the market. Select finishes that complement the rest of the house.
- Choose the product that is appropriate for the location and best meets the need whether it is for water resistance, durability or cleaning.
- Determine the preparation requirements for each type of finish.
- Use a trained or licensed installer.
- Choose finishes that are low emission and environmentally friendly such as paints that carry the EcoLogo symbol or water-based adhesives.
- Selecting finishes that don't match the rest of the house or intended use will yield poor results. For example, carpeting would not be appropriate to install in a moist basement where it would be damp and support mold growth.
- Improper installation of finishes will void the warranty.
- Ceramic tile or grout can crack because of inadequate subfloor construction. Hardwood flooring can shrink or swell if it is not allowed time to condition to the humidity of the space before installation or if it is installed on basement floors or floors with radiant heat.
- Solvent-based finishes will off-gas and may cause IAQ problems.

**Zoning and regulations**

---

- What are the local land use restrictions?
- What permits are required?
- Does current liability insurance cover accidents due to the construction work?
- Does existing fire insurance cover the new work during construction?
- Does the mortgage lender need to approve any major addition?
- Check with your local building inspection department for information on permits, inspections, zoning and any other applicable bylaws. These issues may determine the feasibility of your proposed addition.
- Check with your insurance agent and ensure that you have adequate coverage during and after the renovation. Upgrade as needed.
- Secure approval, if needed, from your mortgage lender.
- Building officials may stop your project for non-compliance with codes and regulations. Penalties or fines may be imposed. The work may be delayed or have to be redesigned.
- Lack of or inadequate insurance could lead to financial liability. Even homeowners doing their own work may need to have workers' compensation coverage (if using any casual labour).
- Your mortgage may be foreclosed if a required approval was not given.

Use the **Mechanical Systems Safety and Comfort Assessment Worksheet** to record the present condition, any problems with your mechanical system and preliminary costing.

Mechanical Systems Safety and Comfort Assessment Worksheet		
Type of heating system		
Year installed		
Last time service performed (There should be a service technician's sticker on the unit.)		
Last filter change		
Oil or woodburning stoves or fireplaces?		
Last time the chimney was cleaned?		
Can smoke be smelled in the house?		
Comfort Issues	Present condition/Problems	Cost
• noise		
• dust		
• uneven heat distribution (cold spots in the house)		
• lingering smells		
• fuel smells		
• too humid in winter		
• too dry in winter		
• too hot in summer		
Other		

## Costing Your Project

Cost of maintenance and system upgrades will depend on the work that needs to be done. Simple housekeeping work that you can do will cost nothing

other than any needed replacement oil or filters.

When reviewing bids from contractors for equipment replacement or

modifications, make sure that the quotations you are comparing are for similar work, including the same or truly equivalent equipment.

## Other useful information from Canada Mortgage and Housing Corporation

*A Guide to Mechanical Equipment for Healthy Indoor Environments,*  
Free (62015)

*Healthy Housing Renovation Planner,*  
\$34.95 (60957)

*Homeowner's Inspection Checklist,*  
\$19.95 (62114)

*Renovator's Technical Guide,*  
\$34.95 (61946)

*The Clean Air Guide: How to Identify and Correct Indoor Air Problems in Your Home,*  
\$ 5.95 (61082)

*About Your House* fact sheets, Free

*Measuring Humidity in Your Home,* (62027)

*Combustion Gases in Your Home,* (62028)

*Your Furnace Filter,* (62041)

*How to Hire a Contractor,* (62277)

*Assessing the Comfort and Safety of Your Home's Mechanical Systems,* (62266)

To order these publications (order number is shown in brackets) and to find out about other CMHC publications, contact:

Your local CMHC office or  
Canada Mortgage and Housing Corporation  
700 Montreal Road  
Ottawa ON K1A 0P7

Phone: **1 800 668-2642**

Fax: 1 800 245-9274

Visit our home page at **[www.cmhc-schl.gc.ca](http://www.cmhc-schl.gc.ca)**

© 2000 Canada Mortgage and Housing Corporation  
Printed in Canada  
Produced by CMHC

Although this information product reflects housing experts' current knowledge, it is provided for general information purposes only. Any reliance or action taken based on the information, materials and techniques described are the responsibility of the user. Readers are advised to consult appropriate professional resources to determine what is safe and suitable in their particular case. CMHC assumes no responsibility for any consequence arising from use of the information, materials and techniques described.